

asyn – asyn Record

Table of Contents

<u>asyn Record</u>	1
<u>Contents</u>	1
<u>Overview</u>	1
<u>Device Address Control Fields</u>	2
<u>Input/Output Control Fields</u>	3
<u>Output Control Fields</u>	4
<u>Input Control Fields</u>	5
<u>Serial Control Fields</u>	6
<u>GPIB Control Fields</u>	7
<u>Trace Control Fields</u>	8
<u>Connection Management Fields</u>	9
<u>Error Status Fields</u>	10
<u>Private Fields</u>	10
<u>Record Processing</u>	10
<u>Obsolete serial and GPIB records</u>	10
<u>medm screens</u>	12
<u>Main control screen, asynRecord.adl</u>	12
<u>Serial port setup screen, asynSerialPortSetup.adl</u>	13
<u>GPIB setup screen, asynGPIBSetup.adl</u>	13
<u>Socket setup screen, asynSocketSetup.adl</u>	13
<u>Restrictions</u>	14
<u>Example #1</u>	14
<u>Example #2</u>	15

asyn Record

Mark Rivers and Marty Kraimer

Contents

- [Overview](#)
- [Device Address Control Fields](#)
- [Input/Output Control Fields](#)
- [Output Control Fields](#)
- [Input Control Fields](#)
- [Serial Control Fields](#)
- [GPIB Control Fields](#)
- [Trace Control Fields](#)
- [Connection Management Fields](#)
- [Error Status Fields](#)
- [Private Fields](#)
- [Record Processing](#)
- [Restrictions](#)
- [Obsolete serial and GPIB records](#)
- [medm screens](#)
- [Example 1](#)
- [Example 2](#)

Overview

The asyn record is designed to provide access to nearly all of the features of the asyn facility. It includes the ability to:

- Perform I/O to any asyn device that supports the asynOctet interface.
- Allow EPICS to communicate with a new device without rebooting the IOC, i.e. without writing any C code or changing the database. This allows Channel Access clients to communicate with devices for which no EPICS device support exists.
- In combination with the scalcout record to format output strings and to parse response strings, eliminate the need for C device support code in many applications.
- Dynamically change the asyn device "port" and "address", so a single asyn record can be switched from talking to one device to another at run time.
- Provide access to asynTrace, controlling debugging output for any asyn device.
- Control the the baud rate, parity, etc. for local serial ports.
- Control the GPIB address and execute global and addressed commands for GPIB devices.
- Create asyn socket ports dynamically at run time for new TCP/IP or UDP/IP connections.

There are two output fields, AOUT (ASCII Output) and BOUT (Byte Output). The OFMT (Output Format) field is used to select one of these fields or the other as the output source to the device. Similarly, there are two input fields, AINP (ASCII Input) and BINP (Byte Input). The IFMT (Input Format) field is used to select one or the other as the destination of data sent from the device. The ASCII fields are type DBF_STRING, and are very convenient for typical communication with many devices. They permit, for example, medm screens where the user can type a string and observe the response from the instrument. The ASCII fields, however are limited to 40

asyn – asyn Record

characters in length, and cannot be used to read or write binary data. The byte input and output fields are DBF_CHAR arrays, and can be used to transfer large blocks of arbitrary data, either ASCII or binary.

In the "Access" columns in the field description tables:

R Read only

R/W Read and write are allowed

R/W* Read and write are allowed; write triggers record processing if the record's SCAN field is set to "Passive".

N No access allowed

Device Address Control Fields

Name	Access	Prompt	Data type	Description
PORT	R/W	"asyn port"	DBF_STRING	The asyn "port" name. This field can be changed at any time to connect the record to another asyn device.
ADDR	R/W	"asyn address"	DBF_LONG	The asyn address. This field can be changed at any time to connect the record to another asyn device. The asyn address parameter is currently only used for GPIB devices, but in the future it may be used for RS-485 and other applications.
SOCK	R/W	"Socket address"	DBF_STRING	The name of a server:port for a TCP/IP or UDP/IP socket connection. This field can be changed at any time to connect to a new socket. It creates a new port with the same name as the socket string, and connects the record to that port. Syntax is "server:port [protocol]", e.g. "corvette:21", "164.54.160.50:21", or "corvette:21 udp". The protocol specifier is optional. TCP is used by default.

The asyn record does not have traditional INP or OUT fields for input and output links. Rather it provides the PORT and ADDR fields to allow dynamically changing what asyn device the record is connected to.

Writing to the PORT or ADDR fields causes the asyn record to disconnect from the current device and connect to the specified asyn port and address. This permits a single asyn record to be used to control any asyn device.

Writing to these fields does not cause any I/O to be done.

Writing to the SOCK field causes the record to create a new asyn port with the same name as the SOCK field. This is done with drvAsynIPPortConfigure.

Input/Output Control Fields

Name	Access	Prompt	Data type	Description
VAL	R/W	"Value field (unused)"	DBF_STRING	This field is unused. The functions normally assigned to the VAL field in many records are performed by the AOUT, BOUT, AINP, and BINP fields in the asyn record.
TMOD	R/W	"Transaction mode"	DBF_RECCHOICE	The type of I/O transaction to perform when the record is processed. The choices are: "Write/Read" (default) "Write" "Read" "Flush" "NoI/O"
TMOT	R/W	"Timeout (sec)"	DBF_DOUBLE	The timeout value for read and write operations in seconds. If a response is not received from the device within this time then the record sets a major alarm. –1.0 means wait forever, no timeout. Default=1.0

The TMOD field controls what type of I/O is performed when the record processes.

"Write/Read" (default)	The output source (AOUT or BOUT as selected by OFMT) is sent to the device. A response is then read back into AINP or BINP (as selected by IFMT). The response must be received within the time specified by TMOT. The input buffer is flushed before the write operation, so that any characters received prior to the write operation are discarded. The Write/Read operation is "atomic", meaning that it is guaranteed that no other asyn I/O to the device will occur between the write and read operations.
"Write"	The output source (AOUT or BOUT as selected by OFMT) is sent to the device. No response is read back.
"Read"	Data is read from the device into the input field (AINP or BINP as selected by IFMT). The response must be received within the time specified by TMOT. No output is sent to the device prior to the read operation.
"Flush"	The input buffer is flushed. Nothing is sent to the device or read from the device.
"NoI/O"	The record processes but no I/O is actually performed. This mode can be used as a safety feature when using an asyn record to just control the trace fields of asyn ports. If the record is in this mode and is accidentally processed, then no I/O will occur.

Output Control Fields

Name	Access	Prompt	Data type	Description
AOUT	R/W*	"Output string"	DBF_STRING	The output string which is sent to the device if OFMT="ASCII". The number of bytes sent to the device will be <code>strlen(AOUT)</code> plus <code>strlen(OEOS)</code> .
BOUT	R/W*	"Output byte data"	DBF_CHAR (array)	The output data which is sent to the device if OFMT="Binary" or "Hybrid". The maximum length of this field is controlled by OMAX. The actual number of bytes to be sent to the device when OFMT="Hybrid" will be <code>strlen(BOUT)</code> plus <code>strlen(OEOS)</code> . The actual number of bytes to be sent to the device when OFMT="Binary" will be NOWT.
OEOS	R/W	"Output terminator"	DBF_STRING	A character string that is appended to the output before transmission to the device. This field is ignored if OFMT="Binary". Set this field to "" to suppress transmission of a terminator. Commonly used values are "\r" (the default), "\n", and "\r\n".
OMAX	R	"Max. size of output array"	DBF_LONG	The allocated length of the BOUT array. This value cannot be changed after IOC initialization. Default=80.
NOWT	R/W	"Number of bytes to write"	DBF_LONG	The number of bytes to send from the BOUT array to the device if OFMT="Binary". This value must be less than or equal to OMAX. Default=80.
NAWT	R/W	"Number of bytes actually written"	DBF_LONG	The actual number of bytes written in the last write operation. This field is valid for all OFMT modes. This number includes the output terminator, if any.
OFMT	R/W	"Output format"	DBF_RECCHOICE	The output format. The choices are: "ASCII" The data sent to the device will be taken from the AOUT field. "(default) "Hybrid" The data sent to the device will be taken from the BOUT field. "Binary" The data sent to the device will be taken from the BOUT field.

There are two output fields, AOUT (ASCII Output) and BOUT (Byte Output). The OFMT (Output Format) field is used to select one of these fields or the other as the output source to the device.

If OFMT="ASCII" then the AOUT fields and OEOS fields are processed with `dbTranslateEscape()` to convert control characters (e.g. "\r", "\021") to bytes, these fields are combined into a single buffer, the length of the output is determined with `strlen()`, and the string is sent to the device.

If OFMT="Hybrid" then the BOUT fields and OEOS fields are processed with dbTranslateEscape() to convert control characters (e.g. "\r", "\021") to bytes, these fields are combined into a single buffer, the length of the output is determined with strlen(), and the string is sent to the device.

If OFMT="Binary" then the NOWT bytes from the BOUT field are sent to the device. The OEOS field is ignored, and dbTranslateEscape() is not called.

Input Control Fields

Name	Access	Prompt	Data type	Description
AINP	R	"Input string"	DBF_STRING	The input string which is read from the device if IFMT="ASCII". The string will be null terminated. Note that due to the maximum size of a string in EPICS, the input string must be less than 40 characters. If longer strings are required then set IFMT="Hybrid" and read into the BINP field.
BINP	R	"Input byte data"	DBF_CHAR (array)	The input data which is read from the device if IFMT="Hybrid" or IFMT="Binary". The maximum length of this field is controlled by IMAX. The actual number of bytes read from the device is given by NORD.
IEOS	R/W	"Input terminator"	DBF_STRING	A string that indicates the end of a message on input. Set this field to "" if no input terminator should be used. This field is ignored if IFMT="Binary". Commonly used values are "\r" (the default), "\n", and "\r\n". The input terminator is removed from the input buffer after the read.
IMAX	R	"Max. size of input array"	DBF_LONG	The allocated length of the BINP array. This value cannot be changed after IOC initialization. Default=80.
NRRD	R/W	"Number of bytes to read"	DBF_LONG	The requested number of bytes to read. This field is valid for all IFMT modes. If this field is <= 0, then the requested number of bytes to read will be the EPICS defined MAX_STRING_SIZE=40 (if IFMT="ASCII") or IMAX (if IFMT="Hybrid" or "Binary"). Default=0.
NORD	R	"Number of bytes read"	DBF_LONG	The actual number of bytes read in the last read operation. This field is valid for all IFMT modes. This number includes the input terminator, if any.
IFMT	R/W	"Input format"	DBF_RECCHOICE	The input format. The choices are: "ASCII" (default) The data read from the device will be placed in the AINP field. "Hybrid" The data read from the device will be placed in the BINP field.

asyn – asyn Record

				"Binary"	The data read from the device will be placed in the BINP field.
TINP	R	"Translated input"	DBF_CHAR (array)	This field will contain up to the first 40 characters of the AINP or BINP fields (depending on IFMT), after translation with <code>epicsStrSnPrintEscaped</code> , to convert non-printable characters to a printable form (e.g. <code>\r</code> , <code>\n</code> , etc.)	

There are two input fields, AINP (ASCII Input) and BINP (Byte Input). The IFMT (Input Format) field is used to select one or the other as the destination of data sent from the device.

A read operation terminates when any 1 of the following 4 conditions is met:

1. The input terminator (IEOS) is found (if IFMT="ASCII" or "Hybrid")
2. EOI asserted (GPIB only)
3. The desired number of input characters (NRRD) are received
4. The timeout (TMOT) expires

If IFMT="ASCII" then the IEOS field is processed with `dbTranslateEscape()` to convert control characters (e.g. `"\r"`, `"\021"`) to bytes, and the asyn input terminator is set to this string. The input is read into the AINP field. The input terminator string, if present, is removed from AINP after the read, and AINP will be null terminated.

If IFMT="Hybrid" then the IEOS field is processed with `dbTranslateEscape()` to convert control characters (e.g. `"\r"`, `"\021"`) to bytes, and the asyn input terminator is set to this string. The input is read into the BINP field. The input terminator string, if present, is removed from BINP after the read, and BINP will be null terminated.

If IFMT="Binary" then the IEOS field is ignored, and no asyn input terminator is used. The input is read into the BINP field. BINP will be null terminated.

The TINP field is intended for operator display. It will contain up to the first 40 characters of the input read into AINP (if IFMT="ASCII") or BINP (if IFMT="Hybrid" or "Binary"). Non-printable characters are first converted to a printable form using `epicsStrSnPrintEscaped`. This field should not normally be using for parsing the response from the device. This is the field that is shown as the ASCII input field in the medm display `asynRecord.adl`. It is useful for displaying the device response, even in "Hybrid" and "Binary" input modes.

The IEOS terminator field is 40 characters long. However, the serial drivers permit 2 character end-of-message strings at most. The GPIB drivers only permit 1 character end-of-message strings.

Serial Control Fields

BAUD	R/W	"Baud rate"	DBF_RECCHOICE	The baud rate for the port. Choices are "Unknown", "300", "600", "1200", "2400", "4800", "9600", "19200", and "38400", "57600", "115200", and "230400". Default="Unknown".
PRTY	R/W	"Parity"	DBF_RECCHOICE	The device parity. Choices are "Unknown", "None", "Even", and "Odd". Default="Unknown".

asyn – asyn Record

DBIT	R/W	"Data bits"	DBF_RECCHOICE	The number of data bits. Choices are "Unknown", "5", "6", "7", and "8". Default="Unknown".
SBIT	R/W	"Stop bits"	DBF_RECCHOICE	The number of stop bits. Choices are "Unknown", "1" and "2". Default="Unknown".
FCTL	R/W	"Flow control"	DBF_RECCHOICE	The flow control. Choices are "Unknown", "None" and "Hardware". Default="Unknown".

The above fields are used to set the serial port parameters. A write to any of these fields causes the port parameters to be changed immediately, but does not cause any I/O to be performed. The port parameters can currently be set only for local serial ports, including IP-Octal on vxWorks. They cannot currently be set for Ethernet/serial adapters like the Moxa units.

The "Unknown" choice for each option is used on readback if the driver does not support that option. "Unknown" should not be written into the field.

The baud rates actually available are device dependent. For the SBS IP-Octal module the maximum baud rate is 38400.

These record fields are set to the values currently in effect for the port when the connection to the port is made.

GPIO Control Fields

Name	Access	Prompt	Data type	Description
ADDR	R/W	"GPIO address"	DBF_LONG	The GPIO address of the device. This field can be changed at any time.
SPR	R	"Serial Poll Response"	DBF_UCHAR	The device status byte, which is read during a Serial Poll operation.
UCMD	R/W*	"Universal command"	DBF_RECCHOICE	A GPIO Universal Command to be executed. . The choices are: "None" "Device Clear (DCL)" "Local Lockout (LL0)" "Serial Poll Disable (SPD)" "Serial Poll Enable (SPE)" "Unlisten (UNL)" "Untalk (UNT)"
ACMD	R/W*	"Addressed command"	DBF_RECCHOICE	A GPIO Addressed Command to be executed. The choices are: "None" "Group Execute Trig. (GET)" "Go To Local (GTL)"

asyn – asyn Record

				"Selected Dev. Clear (SDC)" "Take Control (TCT)" "Serial Poll"
--	--	--	--	--

GPIB Universal Commands are commands which are directed to all devices on the GPIB bus, not just addressed devices. If the UCMD field is set to any value except "None" then the appropriate Universal Command is executed, and UCMD is set back to "None". The record processing only performs the Universal Command, i.e. it does not also perform the GPIB operation indicated by TMOD.

GPIB Addressed Commands are commands which are directed to only the addressed devices on the GPIB bus. If the ACMD field is set to any value except "None" then the appropriate Addressed Command is executed, and ACMD is set back to "None". The record processing only performs the Addressed Command, i.e. it does not also perform the GPIB operation indicated by TMOD.

Trace Control Fields

Name	Access	Prompt	Data type	Description
TMSK	R/W	"Trace mask"	DBF_LONG	The asynTraceMask.
TB0	R/W	"Trace error"	DBF_RECCHOICE	The ASYN_TRACE_ERROR bit. Choices are "Off" and "On".
TB1	R/W	"Trace IO device"	DBF_RECCHOICE	The ASYN_TRACEIO_DEVICE bit. Choices are "Off" and "On".
TB2	R/W	"Trace IO filter"	DBF_RECCHOICE	The ASYN_TRACEIO_FILTER bit. Choices are "Off" and "On".
TB3	R/W	"Trace IO driver"	DBF_RECCHOICE	The ASYN_TRACEIO_DRIVER bit. Choices are "Off" and "On".
TB4	R/W	"Trace flow"	DBF_RECCHOICE	The ASYN_TRACE_FLOW bit. Choices are "Off" and "On".
TIOM	R/W	"Trace I/O mask"	DBF_LONG	The asynTraceIOMask.
TIB0	R/W	"Trace IO ASCII"	DBF_RECCHOICE	The ASYN_TRACEIO_ASCII bit. Choices are "Off" and "On".
TIB1	R/W	"Trace IO escape"	DBF_RECCHOICE	The ASYN_TRACEIO_ESCAPE bit. Choices are "Off" and "On".
TIB2	R/W	"Trace IO hex"	DBF_RECCHOICE	The ASYN_TRACEIO_HEX bit. Choices are "Off" and "On".
TSIZ	R/W	"TraceIO truncate size"	DBF_LONG	The parameter passed to asynTraceSetTraceIOTruncateSize(). This value is used to limit the number of I/O bytes printed by traceIO.
TFIL	R/W		DBF_STRING	

asyn – asyn Record

		"Trace IO file"		The name of the file to which trace information is printed.
--	--	-----------------	--	---

The above fields are used to control the asynTrace facility. They allow one to turn on and off debugging output printed at the shell or written to the trace file.

The TMSK field allows one to read/write the entire asynTraceMask word. The TB0–TB4 fields allow one to read/write the individual bits in asynTraceMask. Similarly, the TIOM field allows one to read/write the entire asynTraceIOMask word, and the TIB0–TIB2 fields allow one to read/write the individual bits in asynTraceIOMask

When the asyn record is connected to a new device with the PORT and ADDR fields the above trace fields are automatically updated to reflect the current asynTrace and asynTraceIO masks for that device.

The TFIL field is used to set the name of the trace file. It is not possible for the asyn record to determine the current file name if the record did not set it. In this case the file name is displayed as "Unknown". Set this field to a string file name (including possibly a valid path from the IOC's current default directory) to have the output written to that file. Set the string to "" (null string) to set the output to the EPICS error logging facility.

Connection Management Fields

Name	Access	Prompt	Data type	Description
AUCT	R/W	"Autoconnect"	DBF_RECCHOICE	Sets the autoconnect option. Choices are "noAutoConnect" and "autoConnect". The value read reflects current state of the autoconnect flag, i.e. the value returned from isAutoConnect().
ENBL	R/W	"Disable/Enable"	DBF_RECCHOICE	Disables or enables the port. Choices are "Disable" and "Enable". The value read reflects current state of the enabled flag, i.e. the value returned from isEnabled().
CNCT	R/W	"Connect/Disconnect"	DBF_RECCHOICE	Disconnects or connects the device. Choices are "Disconnect" and "Connect". The value read reflects current state of the connected flag, i.e. the value returned from isConnected().

Error Status Fields

Name	Access	Prompt	Data type	Description
ERRS	R	"Error status"	DBF_STRING	Error status string for the most recent operation. This string is set to "" (null string) at the start of each connection and I/O operation.

The ERRS field is set to "" (null string) at the start of every operation, including trace and connection management operations. It contains the first 40 characters of any error message the record writes with `asynPrint(...ASYN_TRACE_ERROR...)`.

The standard EPICS record fields STAT (status) and SEVR (severity) are used to report the I/O error status. For example status field may be set to NO_ALARM, WRITE, READ, or COMM, and the SEVR field may be set to NO_ALARM, MINOR, or MAJOR. These alarm fields are only used to report I/O errors or errors when connecting to a new PORT or ADDR. They are not affected by trace or connection management operations.

Private Fields

Name	Access	Prompt	Data type	Description
IPTR	N	"Input buffer pointer"	DBF_NOACCESS	The pointer to the buffer for the BINP field.
OPTR	N	"Output buffer pointer"	DBF_NOACCESS	The pointer to the buffer for the BOUT field.

Record Processing

The asyn record processes, i.e. performs the I/O operation given by TMOD, according to the normal rules for EPICS records. The AOOUT and BOUT fields are Process Passive, so the record will process if these fields are written to and the SCAN field of the record is Passive. The scan field of the record can be set to any of the periodic scan rates (e.g. "1 second") for periodic processing, or to "Event" for event processing. "I/O Intr" scanning is currently not supported (but see [Restrictions](#) below).

Obsolete serial and GPIB records

The asyn record is designed to be a complete replacement for the older generic serial ("serial") and generic GPIB ("gpib") records. These records are no longer needed, and will not be supported in the future. The following is a list of the differences between the old serial and GPIB records and the new asyn record which may require changes to databases or applications.

asyn – asyn Record

- The ODEL field has been replaced by OEOS. It has changed from a DBF_LONG to DBF_STRING in order to support multi-character terminators.
 - The IDEL (serial) and EOS (gpib) fields have been replaced by IEOS. They have changed from a DBF_LONG to DBF_STRING in order to support multi-character terminators.
 - The INP field has been replaced by the PORT and ADDR fields in order to support run-time connection to different devices.
 - The AOUT and OEOS fields are processed by dbTranslateEscape before being sent to the device. In rare cases this may require changing the output strings if these contained the "\" character.
 - The asyn record always posts monitors on the input field (AINP or BINP) when the record processes. The older records did not post monitors on the AINP field if the value was the same as the previous read. This caused problems for some SNL programs and data acquisition applications.
 - The ODEL and IDEL fields were used even when OFMT or IFMT were in "Binary" mode. OEOS and IEOS are now ignored when OFMT or IFMT respectively are in "Binary" mode.
 - The TMOT field has changed from DBF_LONG to DBF_DOUBLE, and the units have changed from milliseconds to seconds. TMOT=-1.0 now means wait forever.
-

medm screens

The following are screen shots of the medm screens provided for the asyn record.

Main control screen, asynRecord.adl

asynRecord.adl

asynTest

Port: L0 Address: 15 More...

Error:

Connected Enabled autoConnect

Connect Enable autoConnect

Timeout (sec): 1.0000 Transfer: Write/Read

Output Format: ASCII Terminator: \r

ASCII:

Length: Requested: 40 Actual: 0

Input Format: ASCII Terminator: \r

ASCII:

Length: Requested: 0 Actual: 0

I/O Status: I/O Severity: INVALID

Scan: Passive Process

traceMask traceIOMask

0x1 0x0

Off On traceError Off On traceIOASCII

Off On traceIODevice Off On traceIOEscape

Off On traceIOFilter Off On traceIOHex

Off On traceIODriver 80 Truncate size

Off On traceFlow

Trace file: Unknown

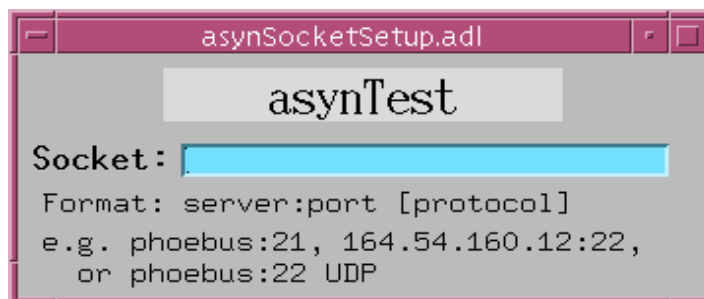
Serial port setup screen, asynSerialPortSetup.adl



GPIO setup screen, asynGPIOSetup.adl



Socket setup screen, asynSocketSetup.adl



Restrictions

I/O Event Scanning (SCAN="I/O Intr") should be supported when the transfer mode (TMOD) is "Read". In this case the record should process whenever a complete message is received. A complete message is defined by the input delimiter (IEOS) and/or the requested number of input characters (NRRD), being received. The timeout field (TMOT) will not apply when SCAN="I/O Intr". This will be added in the future.

Example #1

The following is an IDL program that demonstrates the use of the asyn record. It transfers data in both ASCII and binary formats. Hopefully the IDL syntax is clear enough to be understood by non-IDL users, and can be translated into your favorite scripting language.

```
; This IDL program demonstrates the use of the EPICS asyn record.
; The program uses 2 asyn records. The ports corresponding to these
; 2 records are connected with a null-modem cable
; Record 1 sends a message to record 2 in ASCII.
; Record 2 sends a message back to record 1 in binary.

; Record names
rec1 = '13LAB:serial2'
rec2 = '13LAB:serial3'
recs = [rec1, rec2] ; Array with both record names
; Set up port parameters for both records:
; 19,200 baud, 8 data bits, 1 stop bit, no parity, no flow control
; Timeout=1 second
for i=0, 1 do begin
    rec = recs[i]
    t = caput(rec+'.BAUD', '19200')
    t = caput(rec+'.DBIT', '8')
    t = caput(rec+'.SBIT', '1')
    t = caput(rec+'.PRTY', 'None')
    t = caput(rec+'.FCTL', 'None')
    t = caput(rec+'.TMOT', 1.0)
endfor

; Put record 1 in ASCII output mode, <CR> output delimiter,
; binary input mode, no input delimiter
t = caput(rec1+'.OFMT', 'ASCII')
t = caput(rec1+'.OEOS', '\r')
t = caput(rec1+'.IFMT', 'Binary')
t = caput(rec1+'.IEOS', '')
; Put a monitor on record 1 Binary input field
t = casetmonitor(rec1+'.BINP')
; Clear the monitor by reading the value
t = caget(rec1+'.BINP', junk)

; Put record 2 in Binary output mode, no output delimiter
; ASCII input mode, <CR> input delimiter
t = caput(rec2+'.OFMT', 'Binary')
t = caput(rec2+'.OEOS', '')
t = caput(rec2+'.IFMT', 'ASCII')
t = caput(rec2+'.IEOS', '\r')

; Put record 2 in read transfer mode
t = caput(rec2+'.TMOD', 'Read')
; Put a monitor on record2 ASCII input field
t = casetmonitor(rec2+'.AINP')
```

asyn – asyn Record

```
; Clear the monitor by reading the value
t = caget(rec2+'.AINP', junk)

; Process record 2; this will cause it to wait for data
t = caput(rec2+'.PROC', 1)
; Put record 1 in Write transfer mode
t = caput(rec1+'.TMOD', 'Write')
; Send a message to port 2
message = 'Request data: '+string(systemtime())
print, 'Record 1 sent message: ' + message
t = caput(rec1+'.AOUT', message)

; Wait for monitor on record2 ASCII input field
while (not cachecheckmonitor(rec2+'.AINP')) do wait, .1
; Read data from record 2
t = caget(rec2+'.AINP', input)
print, 'Got a message from record 1: ', input

size=256
; Put record 1 in read mode, expect "size" byte input
t = caput(rec1+'.TMOD', 'Read')
t = caput(rec1+'.NRRD', size)
; Process record 1; this will cause it to wait for data
t = caput(rec1+'.PROC', '1')

; Put record 2 in write mode
t = caput(rec2+'.TMOD', 'Write')
; Send an 8 bit binary sin wave, "size" points long from
; port 2 to port 1
send_data = byte(sin(findgen(size)/5)*126 + 127)
t = caput(rec2+'.NOWT', size)
t = caput(rec2+'.BOUT', send_data)

; Wait for monitor on channel 1 binary input
while (not cachecheckmonitor(rec1+'.BINP')) do wait, .1

; Record 1 should have received "size" bytes. Make sure NORD=size
t = caget(rec1+'.NORD', nord)
if (nord eq size) then $
    print, 'Read array data OK' $
else $
    print, 'Error reading array data!'

; Read data from record 1
t = caget(rec1+'.BINP', rec_data, max=nord)

; Plot it
plot, rec_data

end
```

Example #2

The following is an IDL procedure that demonstrates the use of the asyn record to communicate with a Tektronix TDS200 Digital Oscilloscope. It transfers data in both ASCII and binary formats. It will work with either an RS-232 or GPIB connection to the scope. The record must be loaded with IMAX at least large enough to read the waveform. The entire waveform readout is 2500 channels on the TDS220. The buffer size required is 1 byte per channel + 7 bytes header/checksum. The start and stop parameters to the procedure can be used to read a subset of the waveform.

asyn – asyn Record

Hopefully the IDL syntax is clear enough to be understood by non–IDL users, and can be translated into your favorite scripting language.

```
pro read_tds200, record, data, start=start, stop=stop, chan=chan

; This procedure reads waveforms from the Tektronix TDS200 series scopes
; Mark Rivers
; Modifications:
;   March 7, 2001 Correctly put record in Write and Write/Read modes.
;   Dec. 7, 2001 Set timeout to 2 seconds before read.
;   March 30, 2004 Change IFMT from Binary to Hybrid, other fixes.

if (n_elements(start) eq 0) then start=1
if (n_elements(stop) eq 0) then stop=2500
if (n_elements(chan) eq 0) then chan=1
chan = 'CH'+strtrim(chan,2)

aout = record + '.AOUT'
binp = record + '.BINP'
tmod = record + '.TMOD'
ifmt = record + '.IFMT'
binp = record + '.BINP'
nord = record + '.NORD'
tmot = record + '.TMOT'
oeos = record + '.OEOS'
ieos = record + '.IEOS'

; Set the terminators to newline (assumes scope is set up this way)
t = caput(oeos, '\n', /wait)
t = caput(ieos, '\n', /wait)

; Set the transfer mode to write
t = caput(tmod, 'Write', /wait)

; Set the encoding to positive binary, start and stop readout channels
; Set the readout range. Can't do as one command, exceed 40 characters
command = 'DATA:ENC RPB; DATA:START ' + strtrim(start,2)
t = caput(aout, command, /wait)
command = 'DATA:STOP ' + strtrim(stop,2)
t = caput(aout, command, /wait)

;Set DATA:WIDTH to 2
;command = 'DATA:WIDTH 2'
;t = caput(aout, command, /wait)

;Set channel number
command = 'DATA:SOURCE ' + strtrim(chan,2)
t = caput(aout, command, /wait)

; Set the input mode to hybrid. Large buffer but line-feed terminator
t = caput(ifmt, 'Hybrid', /wait)

; Set the transfer mode to write/read
t = caput(tmod, 'Write/Read', /wait)

; Empirically the timeout needs to be about 5 seconds for
; 1024 channels with RS-232
t = caput(tmot, 5.0)

; Read the scope
t = caput(aout, 'Curve?', /wait)
```

asyn – asyn Record

```
; Get the data
t = caget(binp, data)

; Check the number of bytes read. See if it's what's expected
n_data = stop-start+1
n_header = 2 + strlen(strtrim(n_data, 2))
n_checksum = 1
n_expected = n_header + n_data + n_checksum
t = caget(nord, n)
if (n ne n_expected) then $
    print, 'Scope returned:', n, '$' bytes, expected: ', n_expected

; The first n_header bytes are header, the last byte is checksum.
; Data are offset by 127, convert to long
data = data[n_header:n-2] - 127L

return
end
```

Suggestions and comments to: Mark Rivers : (rivers@cars.uchicago.edu)

Last modified: March 30, 2004

asyn – asyn Record